Claims

1.-5. (Cancelled)

6. (Previously Presented) The method of claim 29, wherein the optical retarder is a ¼-wave retarder.

7.-15. (Cancelled)

16. (Previously Presented) An optical sampling system, comprising:

a data input to receive a test signal;

a sampling pulse input to receive a sampling pulse;

an optical system configured to produce a first combination of the test signal and the sampling pulse having a first relative phase difference between the sampling pulse and the test signal, and to produce a second combination of the test signal and the sampling pulse;

a retardation plate configured to receive the second combination and to modify a relative phase difference between the sampling pulse and the test signal so that the second combination has a second relative phase difference, wherein the second relative phase difference is different from the first relative phase difference;

a first balanced detector and a second balanced detector configured to receive the first combination having the first relative phase difference and the second combination having the second relative phase difference, respectively, and produce a first balanced signal and a second balanced signal, respectively; and

a signal processing system configured to combine the first balanced signal and the second balanced signal.

17. (Previously Presented) The optical sampling system of claim 16, wherein a difference between the first relative phase difference and the second relative phase difference is such that the balanced signal associated with the first relative phase difference is an in-phase signal and the balanced signal associated with the second relative phase difference is a quadrature signal.

18.-28. (Cancelled)

29. (Previously Presented) An optical sampling method, comprising:

receiving an optical data pulse and an optical sampling pulse;

directing first portions of the optical data pulse and the optical sampling pulse to a first balanced detector with a first phase difference to obtain an in-phase balanced electrical signal;

directing second portions of the optical data pulse and the optical sampling pulse to an optical retarder having an axis that is substantially parallel to a polarization direction of one of the second portion of the optical data pulse or the second portion of the optical sampling pulse and then directing the second portions to a second balanced detector with a second phase difference to obtain a quadrature balanced electrical signal; and

combining the in-phase balanced electrical signal and the quadrature balanced electrical signal to obtain a sample signal associated with data pulse intensity.

30. (Previously Presented) The optical sampling system of claim 16, further comprising a memory configured to store sample values based on the combined first balanced signal and second balanced signal.

31. (Previously Presented) The optical sampling system of claim 30, further comprising a display to display the sample values as a function of a time period associated with the test signal.

32. (Previously Presented) The optical sampling system of claim 16, further comprising a controller configured to provide a variable time delay of the sampling pulse with respect to a period associated with the test signal.

33. (Previously Presented) The optical sampling system of claim 32, wherein the period is a bit interval.

34. (Previously Presented) The optical sampling system of claim 16, wherein the retardation plate is configured with an axis that is parallel to the polarization of either the test signal or the sampling pulse in the received second combination.

35. (Previously Presented) The optical sampling system of claim 16, wherein the retardation plate is a ¼-wave retarder.

36. (Previously Presented) The method of claim 29, further comprising displaying an eye diagram based on the sample signal.

37. (Previously Presented) The method of claim 29, further comprising establishing respective polarizations of the optical sampling pulse and the optical data pulse to be perpendicular relative to one another.

38. (Previously Presented) The method of claim 29, further comprising receiving a reference signal based on the optical sampling pulse, wherein the combining of the in-phase balanced electrical signal and the quadrature balanced electrical signal is based on the received reference signal.

39. (Previously Presented) An optical sampling system, comprising:

a sampling source producing a sampling signal comprised of sampling pulses that repeat at a repetition rate;

an input for receiving a data signal comprised of data pulses;

an optical system configured to receive the sampling signal and the data signal, to produce a first combination of the signals having a first relative phase difference between the sampling pulses and the data pulses, and to produce a second combination of the signals having a second relative phase difference between the sampling pulses and the data pulses, wherein the second relative phase difference is different from the first relative phase difference;

a first balanced detector and a second balanced detector configured to receive the first combination and the second combination, respectively, and to produce a first balanced signal and a second balanced signal, respectively; and

a signal processing system configured to combine the first balanced signal and the second balanced signal to produce a linear optical sampling signal.

40. (Previously Presented) The optical sampling system of claim 39, further comprising a triggering system to relay a reference signal based on the sampling signal to the signal processing system, wherein the signal processing system is configured to produce the linear optical sampling signal based on the reference signal.

41. (Previously Presented) The optical sampling system of claim 39, wherein:

the optical system is configured to combine the sampling pulses and the data pulses for a plurality of relative delay times between the data pulses and the sampling pulses; and

the linear optical sampling signal is a function of the plurality of delay times.

42. (Previously Presented) The optical sampling system of claim 39, wherein the repetition rate and a data rate associated with the data signal are such that the sampling pulses scan a period associated with the data signal.

43. (Previously Presented) The optical sampling system of claim 39, wherein the sampling pulses are ultra short pulses having durations less than 10 picoseconds and the data pulses have durations greater than 10 picoseconds.

44. (Previously Presented) The optical sampling system of claim 39, wherein a difference between the first relative phase difference and the second relative phase difference is such that the balanced signal associated with the first relative phase difference is an in-phase signal and the balanced signal associated with the second relative phase difference is a quadrature signal.

45. (Previously Presented) The optical sampling system of claim 39, further comprising a display to display one or more eye diagrams based on the linear optical sampling signal.

46. (Previously Presented) The optical sampling system of claim 39, further comprising an optical modulator or a thermooptic phase shifter configured to establish at least one of the first relative phase difference and the second relative phase difference.

47. (Previously Presented) An optical sampling method, comprising:

receiving an optical data signal and a train of optical sampling pulses, wherein the optical sampling pulses are temporally offset relative to optical data pulses of the optical data signal by a plurality of delay times;

directing first portions of the optical data pulses and the optical sampling pulses with a first relative phase difference to a first balanced detector to obtain corresponding in-phase balanced signal;

directing second portions of the optical data pulses and the optical sampling pulses with a second relative phase difference to a second balanced detector to obtain corresponding quadrature balanced signal; and

combining the in-phase balanced signal and the quadrature balanced signal to obtain corresponding linear optical sampling signal that is a function of the plurality of delay times.

48. (Previously Presented) The method of claim 47, further comprising displaying an eye diagram based on the linear optical sampling signal.

49. (Previously Presented) The method of claim 47, wherein the plurality of delay times are determined by a repetition rate of the optical sampling pulses.

50. (Previously Presented) The method of claim 47, further comprising adjusting a data rate of the optical data signal to determine the plurality of delay times.

51. (Previously Presented) The method of claim 47, further comprising receiving a reference signal based on the train of optical sampling pulses, wherein the combining of the in-phase balanced signal and the quadrature balanced signal is based on the received reference signal.